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Nildag Basak Ceylan[a], Burak Dogan[b,†] and M. Hakan Berument[c]*

[a]Department of Banking and Finance, Yildirim Beyazit University, 06690, Ankara, Turkey; [b]Research and Fund Management Directorate, Central Bank TRNC, Bedrettin Demirel Cad., Lefkoşa; [c]Department of Economics, Bilkent University, 06800, Ankara, Turkey

This article contributes to the asset pricing literature by offering an alternative missing factor: the excess holdings of foreign investors. To incorporate this factor, we mimic the portfolio of foreign investors in Borsa Istanbul (BIST) with respect to portfolio preferences (foreign ownership) using the Fama and French's three-factor model. Our findings suggest that market factor, size, and book-to-market (B/M) variables are still statistically significant and Jensen's alpha is still not significant, and we obtain a statistically significant negative relationship between the excess return of foreign investors' ownership and the return variation of a given portfolio.

Keywords: Fama–French three-factor model; foreign portfolio investment; portfolio returns

JEL classifications: G12, G15

1. Introduction

There is increasing interest in finding better models to explain asset pricing. Higher integration of financial markets and fundamental macroeconomic variables in recent years has stimulated this interest. Despite this renewed popularity, the subject of asset pricing is built upon a vast amount of literature, the foundation of which goes back to the (later called) Sharpe-Lintner-Mossin capital asset-pricing model (CAPM), initiated almost contemporaneously by three different studies: Sharpe (1963), Lintner (1965), and Mossin (1966). Arguably one of the most acknowledged studies in the literature is published by Fama and French (1993), in which the authors compare various models containing combinations of variables used in the literature until that time, and then introduce a three-factor resultant model. Their model includes two additional factors to the market return factor: firm size by means of market capitalisation (M) and book-to-market (B/M) value. Arshanapalli, Coggin, and Doukas (1998) suggest that Fama and French's three-factor model is also applicable for stock markets other than the US' stock market.

In this study, we extend the original Fama–French three-factor asset pricing model by adding a foreign portfolio preference (FS) proxy as a fourth factor to explain the return variation of a given portfolio. The underlying reasoning for extending the model

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with FS is to test the added value of the association between foreign concentration and market return. This association is elaborated on in detail in Subsection 1.2, but first we summarise the accumulated literature on asset pricing in Subsection 1.1 to give the rationale for taking the Fama–French three-factor model as the base model for extension.

1.1.   *Review of the literature*

The single-index model of CAPM explains the return variation of a security by its correlation with other securities. Despite its wide usage, it has been frequently criticised for ignoring firm-specific characteristics. Numerous studies have sought a model that would capture every motive behind return variation by considering a wide range of variables, such as market value, the ratio of B/M value, earnings-to-price ratio, and leverage. Reinganum (1981) considers the earnings-to-price ratio to explain CAPM's misspecifications and depicts a statistically significant improvement. On the other hand, when firms' size effect is controlled for, size appears to be more effective than earnings-to-price ratio. Rosenberg, Reid, and Lanstein (1985) insert a B/M ratio into the model and thus also control for size and equity-to-price ratio. They find a positive relation between a high B/M ratio and monthly average returns.

Fama and French (1992) consolidate market beta, size, equity-to-price ratio, leverage, and B/M ratio to observe the average market return interaction. They find that if market beta is used on its own, discarding the other variables, the results are weak. The other variables, especially size and B/M, give more-accurate results either separately or in combination. Fama and French (1993) obtain better results by limiting the model with three factors, namely market return, M, and B/M value.

Yet, Fama and French's (1993) model has continued to be altered, either by suggesting a different three-factor model or by adding extra factors to the original model. As Chae and Yang (2008) neatly summarise, the failure of asset pricing models is due to one of (or a combination of) three causalities: transaction costs, investor irrationality, or missing risk factors. The literature concentrates mostly on the third one, as most studies seek better risk factors to minimise the variation in return.

For instance, Zhang and Chen (2008) set a new multifactor model by employing investment (investment-to-assets) and productivity (earnings-to-assets) factors instead of Fama and French's size and B/M factors. Zhang and Chen (2008) claim that their model better explains the average returns across portfolios formed on momentum, financial distress, investment, profitability, accruals, net stock issues, earnings surprises, and asset growth. Chen, Marx, and Zhang (2010) offer a new three-factor model based on Tobin's q-theory, which considers: (1) market factor; (2) difference between the return on a portfolio of low-investment stocks and the return on a portfolio of high-investment stocks; and (3) difference between the return on a portfolio of stocks with high returns on assets and the return on a portfolio of stocks with low returns on assets. They claim that their three-factor model captures many of the anomalies that Fama and French (1993) cannot. In a more recent study, Foye, Mramor, and Pahor (2013) suggest replacing the market factor with a term that proxies for accounting manipulation and assert that the results are better than the standard three-factor model in emerging markets.

Most successor studies to Fama and French (1993) aim to conceptualise market anomalies by adding an extra factor to their original three-factor model. The most

prominent variable added is momentum, where it is the construction of portfolios where its return between *t-1* and *t-11* is highest minus where its return between *t-1* and *t-11* is lowest. Momentum might be interpreted as the risk factor mimicked by the return on a portfolio of winner stocks minus the return on a portfolio of loser stocks. As the initiator of this sub-literature, Jegadeesh and Titman (1993) introduce the one-year momentum anomaly and claim to obtain enhanced portfolio returns at a given level of risk. Carhart (1997) obtains statistically significant results by considering market efficiency, market size, B/M ratio, and momentum factors and claims that buying last year's winners is an implementable strategy for capturing the one-year momentum effect. Among many others, Hon and Tonks (2003), L'Her, Masmoudi, and Suret (2004), Bello (2008), Huang and Shiu's (2009), Lam, Li, and So (2010), and Fama and French (2012) test the validity of an augmented three-factor model in different markets by considering the momentum factor to explain further risk variation. Although all of the given references find evidence to support the momentum factor, Fama and French (2012), performing an international comparison over global and local models, still claim that when very small stocks are included into the model, the Gibbons, Ross, and Shanken (GRS) (1989) test rejects the hypothesis that the true intercepts are zero. Even when small stocks are discarded, global models do not explain regional portfolio returns and local models perform poorly on the size-momentum portfolios of Europe and Asia Pacific. Indeed, Al-Mwalla (2012) comes up with a result that encourages reserving judgment on this issue by empirically proving that Fama and French's (1993) three-factor model is superior to the momentum factor-augmented model in the Amman Stock Exchange. Despite its many other benefits, momentum offers a very short horizon (up to one year) to estimate and thus would not be a useful variable to forecast long-run returns.

Liquidity is another factor frequently suggested to explain return variation, and various variables are employed in the literature to mimic it. For instance, following Amihud and Mendelson (1986), Datar, Naik, and Radcliffe (1998) use turnover rate and find evidence on liquidity's effectiveness on cross-sectional stock return variation. Hearn and Piesse (2008) track the same analogy and seek empirical evidence in southern African markets. Their results imply that although big markets respond significantly to liquidity along with size, smaller markets do not. Liu (2006) claims to obtain better results with a two-factor model (market and liquidity factors) by defining a new liquidity measure as the standardised turnover-adjusted number of zero daily trading volumes over the prior 12 months. Gharghori, Chan, and Faff (2007) test whether the Fama–French factors (small minus big [SMB] and high minus low [HML]) capture liquidity risk by definition. The results reveal that the Fama–French 1993 model is not able to proxy for liquidity. Among the contemporary empirical analyses, Minovic and Zivkovic (2012) find supporting evidence in the Serbian market for the superiority of Liu's (2006) model over the CAPM and Fama–French (1993) models. However, Lischewski and Voronkova (2012) cannot find evidence to support a liquidity risk premium in the Polish market for various liquidity measures.

Lee and Swaminathan (2000) designate liquidity as a link between momentum and value and use the average daily turnover in percentage during the portfolio formation period, where daily turnover is the ratio of the number of shares traded each day to the number of shares outstanding at the end of the day. Using this definition of liquidity, Sehgal, Subramaniam, and De La Morandiere (2012) empirically show that the liquidity-augmented Fama–French model is better than the CAPM and three-factor models when tested using Bombay Stock Exchange data. Yet, they find size and short-term momentum anomalies to persist, and point out the necessity for incorporating additional

risk factors into returns. Yuksel, Yuksel, and Doganay (2010) investigate the relationship between stock liquidity and price for Borsa Istanbul (BIST)[1] and find that liquidity is an important factor in pricing stocks.

Some studies devoted to multiple testing of various models already exist in the literature. Avramov and Chordia (2006) use a sample of common stocks from the NYSE, AMEX, and Nasdaq between 1964 and 2001 to test the above models' validity in explaining size, value, and momentum anomalies. They allow factor loadings in first-pass time series regressions to change with firm-level size and B/M, as well as business cycle-related variables. Risk-adjusted returns based on the first-pass regressions are then regressed on size, B/M, turnover, and prior returns. In conclusion, they assert that if beta is not allowed to vary with size, none of the models captures any of the tested anomalies. When beta is allowed to vary with size, turnover and past returns are important determinants of the cross-section of stock returns even when return is adjusted by a liquidity factor, a momentum factor, or both. In a more recent study, Shaker and Elgiziry (2013) test five different models in the Egyptian stock market, including a five-factor model that compromises liquidity and momentum by adding them as the fourth and fifth factors to Fama and French's original three-factor model. They find that although the Fama–French model is superior to CAPM, there is no significant explanation added to the Fama–French model when momentum and liquidity are considered either separately or simultaneously.

For the above reasons, it can well be asserted that searching for a missing factor to obtain a better asset pricing model still remains a vivid and disputable issue. Indeed, Gharghori et al. (2007) highlight this fact by claiming that the 'type of risk the Fama–French factors are capturing and not capturing remains an open question'. Similarly, Avramov and Chordia (2006) reserve the possibility that an as-yet undiscovered risk factor related to the business cycle may capture the impact of momentum on the cross-section of individual stock returns.

1.2. *The role of foreign ownership*

The association between foreign concentration and market return is explained by price pressure, herding, and liquidity. Although several studies confirm the correlation, its direction differs according to markets and time. For instance, Warther (1995) finds a negative relationship between returns and subsequent mutual fund inflows. Clark and Berko (1997) emphasise the beneficial effects of foreign ownership in stock markets based on the 'base-broadening' hypothesis (increase in the investor base), and claim that risk premium in the market would be reduced due to risk sharing with foreigners. They also find a strong correlation between capital inflows and price performance in the Mexican equity market. Choe, Kho, and Stulz (1999) do not find supporting evidence in favour of a destabilising effect of foreign investment on equity prices in Korea, but still emphasise the significant positive feedback on trading and herding by foreign traders. Hargis (1998) states that Latin American stock exchanges became more liquid when they became more open to foreign investors. Stulz (1999) mentions that an increase in foreign investment would lead to a decrease in capital cost without a deterioration in the securities market. Boyer and Zheng (2002) explore a significant correlation between foreign ownership and return in the US market.

Kim and Singal (2000), Brennan and Cao (1997), Stulz (1999), Froot, O'Connell, and Seasholes (2001), Bae, Chan, and Ng (2004), Ananthanarayanan, Krishnamurti, and Sen (2005), Karolyi and Stulz (2002), Agudelo and Castaño (2011), Li, Neguyen, Pham,

and Wei (2011), Kumar and Devi (2013), and Hsu (2013) are among other studies that give empirical evidence on foreign investment and market return correlation.

1.3.   *Borsa Istanbul and foreign inflows*

BIST is the world's fifteenth-largest stock exchange according to M among emerging stock market exchanges, with 201.9 billion US dollar Ms as of the end of 2011. It is the seventh largest stock market according to trading volume, with 423.6 billion US dollars as of the end of 2011. The number of companies traded on the BIST is 363 as of the end of 2011. Foreign investors' portfolio investments in BIST constitute around 62% as of the end of 2011, and constitute 58% on average between January 1999 and December 2011. According to the time trend of foreign market shares in BIST shown in Figure 1, this share percentage is persistent, which indicates an important buffer against their sudden withdrawal.

The effects of foreign investors on BIST have been examined in various studies. Kiymaz (2001) considers the effects of rumours on the stock market regarding foreigners' stock-buying behaviour using the 'Heard on the Street' section of the *Economic Trend Journal*, and finds a positive effect on the stock market. Using a VAR model, Adabag and Ornelas (2005) claim a strong positive correlation between BIST's net foreign portfolio inflow and its US dollar returns. Usta and Guner (2007) look for the effects of operations of foreign investors on BIST and report that they follow the general market index. Gabor (2012) shows strong positive feedback trading in BIST by considering daily returns. Ulku and Ikizlerli (2012) find that foreign portfolios are negatively correlated to past local returns in BIST when analysed with a structural VAR model using monthly data. Sevil, Ozer, and Kulali (2012) examine whether foreign investor decisions are made using information on the BIST market index and relate their behaviour with the change in the return of BIST's market index. They report that the excess return in the market is the result of foreign investors' buying behaviour, which is replicated by domestic investors. Cakan and Balagyozyan (2014) investigate herding in the Turkish banking sector, and they find supporting evidence only on raising markets.
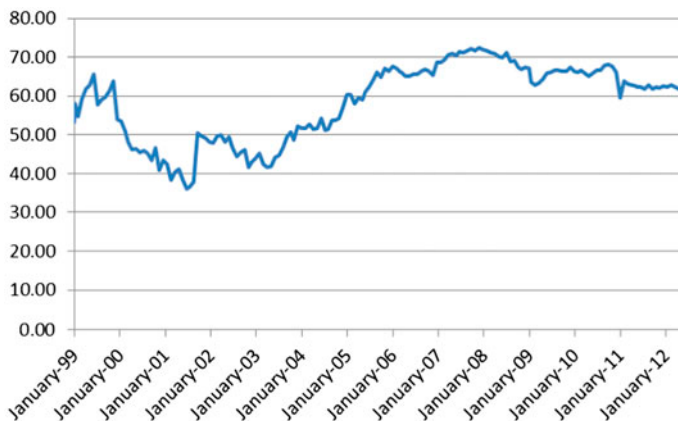

Figure 1.   Foreign ownership in BIST.
Source: Borsa Istanbul.

Balcilar and Demirer (2015) report evidence that there is a dynamic relationship between global factors and herd behaviour in BIST.

After the 2008 financial crisis, determining the effects of inter-market capital flow swings became even more important. This issue is vital for emerging markets because the return of foreign capital is an unquestionably expected process after the halt of big central banks' expansionary policies. This kind of impact of foreign investments on domestic markets is analysed in the literature within the concept of the 'sudden stop'. Calvo (1998) shows that crises are always likely because negative swings occur in capital inflows; therefore, it is reasonable to assume that portfolios would be built by considering foreigners' investments. The consideration of foreign ownership would be through negative or positive feedback, herding, or price pressure. Regardless of the impact channel, market behaviour would be somewhat similar to momentum strategy, by which investors buy past winners and sell past losers. One may thus claim that foreign ownership proxy should also capture Carhart's momentum factor (1997), noted earlier.

Few studies in the literature interpolate the Fama–French three-factor model and foreign ownership, and none introduces foreign ownership as a fourth factor. Jung, Lee, and Park (2009) is a remarkable study, but considers foreign ownership in an augmented two-factor model. Employing augmented foreign ownership proxies to the model, the authors suggest that particular behaviours of designated investor groups would lead to portfolio setup and thus price variation. They test foreign investors as one of these groups for returns in the Korean stock market. Informative, perceptive, and preferential differences between foreign and domestic investors (mainly supported by the relative inelasticity of foreign demand) in the Korean stock market are treated as the source of heterogeneity in the investments, which supposedly causes an inefficiency in asset pricing. The authors claim that the relatively inelastic demand of foreign investors creates room for domestic investors to deviate their portfolio by choosing stocks that are less in demand in order to enjoy low cost and high profit. Eventually, Jung et al. (2009) find that a heterogeneity-augmented two-factor asset pricing model gives robust results (even better than the Fama–French three-factor model) in explaining price variation.

Jung et al.'s (2009) motivation in seeking a heterogeneity effect in Korea leads us to search for the same effect in the Turkish stock market, with additional justifications: While both Turkey and Korea are fast-growing emerging economies and both countries' stock markets have high foreign concentration,[2] Korea's current account gives a surplus while Turkey's moves on a deficit. Thus, Turkey needs relatively more portfolio investment to finance its current account deficit. Furthermore, Turkey's stock exchange mostly consists of financial institutions, in particular commercial banks, while Korea's composition is more balanced. Therefore, Turkish returns are more prone to monetary policy shifts compared to those of the Korean stock market.

In this study, we examine the role of foreign investors' portfolio preferences on stock market returns with an extended Fama–French three-factor model using monthly data between 1999 and 2012.[3] We explain our methodology and data in Section 2, report, discuss our empirical results in Section 3, and conclude the article in Section 4.

2. Data and methodology

In this article, we use the same technique as Fama and French (1993) to construct the portfolio's excess returns and its sensitivity to market premium, size premium, and B/M premium, but we add a fourth factor, foreign ownership, which is the excess return

formed by taking the difference between the portfolios most preferred and less preferred by foreign investors as a share of tradable equities in the market. Much of the literature (summarised to some extent in the previous section) recognises the Fama–French model either as superior to alternative models or at least retain it for comparison. The general perception of its validity led us to modify it by inserting the fourth factor. We use BIST 100 as the market index, gathering the data from its website (borsaistanbul.com). For each month, we take the interest rate of the benchmark bond publicly announced by the Treasury for the corresponding month as the risk-free rate, where the data is gathered from Matrix and the missing observations are obtained from Reuters.[4,5] The data for B/M equity and the M of each stock are obtained from BIST's monthly bulletins. The data regarding stock prices are the monthly closing prices obtained from *Finnet* (http://www.finnet.com.tr). The data on foreign investors' portfolio positions at the end of January for each year between 1999 and 2010 are obtained from *Fortis Yatirim*. The whole data-set covers the period 1999 to 2012; for 2011, however, we use foreign owner-ship data from the Central Securities Depository Institution (CSDI) since *Fortis Yatırım* discontinued gathering the data. We select stocks that have been traded on the national stock market for at least one year in order to incorporate any portfolio constructed at time *t*. Stocks whose names or codes have changed are also incorporated. The Real Estate Investment Trusts (REITS) and units of beneficial interest are excluded from the study. While calculating the returns at year *t*, stocks with a negative B/M equity as of December *t-1* are excluded from the study. All prices and indices we use are dividend corrected. The number of companies that meet our criteria are: 231 for the period of 1999–2000; 202 for 2000–2001; 232 for 2001–2002; 216 for 2002–2003; 219 for 2003–2004; 231 for 2004–2005; 241 for 2005–2006; 241 for 2006–2007; 245 for 2007–2008; 244 for 2008–2009; 241 for 2009–2010; 239 for 2010–2011; and 249 for 2011–2012.

To determine risk factors, we use size, B/M, and FS variables because they are expected to proxy common risk factors in returns. To this end, we use eight stocks sorted with respect to each firm's M, B/M, and FS to form portfolios that mimic those risk factors. For the period 2000 to 2011, in June of period *t,* we rank all stocks traded on BIST with respect to size. We divide the groups into two. B/M value is calculated by the book value of each stock in the fiscal year at period *t-1* divided by the M of each stock as of December *t-1*. The M data are taken as of June of each year. The firms that have negative B/M values as of December *t-1* are not considered in the analysis. We form eight portfolios (MH-BH-FH, MH-BH-FL, MH-BL-FH, MH-BL-FL, ML-BH-FH, ML-BH-FL, ML-BL-FH, and ML-BL-FL) from the intersections of two market equity (ME), two B/M, and two FS groups. Here MH is for high market capitalization, ML is for low market capitalization, BH is for high book-to-market value, BL is for low book-to-market value, FH is for high foreign-share, and FL is for low foreign share. For example, the MH-BL-FL portfolio contains stocks with high M, low B/M value, and low foreign portfolio investment. We calculate the monthly value-weighted returns on the eight portfolios from July of year *t* to June of year *t+1*, and we reform the portfolios in June of *t+1*. To be considered in the data-set, a firm should have stock prices for every December of year *t-1* and June of *t* and a positive B/M at period *t-1*. In addition, we do not include firms unless they appear in BIST from July of year *t* to June of *t+1*.

Our SMB portfolio mimics risk factors related to size, and each month it is calculated by taking the difference between the simple average of the returns on the small stock portfolios (ML-BH-FH, ML-BH-FL, ML-BL-FH, ML-BL-FL) and the simple average of the returns on the big stock portfolios (MH-BH-FH, MH-BH-FL, MH-BL-FH, MH-BL-FL) as follows:

$$SMB = \frac{(ML - BH - FH + ML - BH - FL + ML - BL - FH + ML - BL - FL) - (MH - BH - FH + MH - BH - FL + MH - BL - FH + MH - BL - FL)}{3}.$$

The HML portfolio mimics the risk factors in returns on B/M. Thus, each month, HML is calculated as the difference between the simple average of the returns on the high B/M portfolios (MH-BH-FH, MH-BH-FL, ML-BH-FH, ML-BH-FL) and the average returns on the low B/M portfolios (MH-BL-FH, MH-BL-FL, ML-BL-FH, ML-BL-FL) as follows:

$$HML = \frac{(MH - BH - FH + MH - BH - FL + ML - BH - FH + ML - BH - FL) - (MH - BL - FH + MH - BL - FL + ML - BL - FH + ML - BL - FL)}{3}.$$

Thus, the eight size and B/M portfolios in SMB and HML are value weighted. Using value-weighted portfolios leads us to minimise variance because return variances and size are negatively related. The mimicking portfolios allow us capture varying return behaviours of the small and big stocks as well as high and low B/M stocks, which may in turn result in investments that are more realistic.

In the same way, the fourth factor, Foreign share High minus Foreign share Low (FHL), is calculated by taking the difference between the portfolios most preferred (MH-BH-FH, MH-BL-FH, ML-BH-FH, ML-BL-FH) and least preferred (MH-BH-FL, MH-BL-FL, ML-BH-FL, ML-BL-FL) by foreigners. The data on foreign investor portfolio preferences are taken at the end of January of each year.

In calculating the portfolios' excess returns, $R_t - RF_t$, we sort the firms into three groups based on the breakpoints for the bottom 35% (Low), middle 30% (Medium), and top 30% (High) for the ranked B/M (BL, BM, BH), M (ML, MM, MH), and foreign portfolio investment (FL, FM, FH) values. Therefore, we construct 27 portfolios ($3 \times 3 \times 3$) from the intersection of three B/M, three M, and three foreign investor portfolio preferences (foreign ownership) groups. For example, BH-MM-FL group stocks have high B/M equity, medium M, and stocks that foreign investors prefer less (low foreign ownership).

The three-factor model as suggested by Fama and French (1993) includes the market factor as well as the size and B/M risk factors. According to the model, $R_t - RF_t$ is explained by three factors: market premium, calculated as the excess return on the market portfolio; size premium, SMB; and B/M premium, HML. The model suggested by Fama and French (1993) is as follows:

$$R_t - RF_t = a + b[RM_t - RF_t] + sSMB_t + hHML_t + e_t. \tag{1}$$

To investigate how foreigners' investment preferences affect the model, we add an additional factor, foreign investors' portfolio preferences (foreign ownership) to the model:

$$R_t - RF_t = a + b[RM_t - RF_t] + sSMB_t + hHML_t + fFHL + e_t, \tag{2}$$

where $R_t - RF_t$ is the excess return of the portfolio, and e_t is the error term. b, s, h, and f are the slope coefficients that show the factor sensitivities or loadings. In this four-factor model, we expect the coefficients b, s, h, and f to be significantly different from zero and the intercept not statistically significantly different from zero. So, if our four-factor model is good at capturing variations of the average returns, the intercept, a, should not be significantly different from zero.

3.   Results and discussion

Nine different portfolios are built by sorting the equities according to their market values and B/M values within three categories each. Table 1 reports the average of excess

Table 1. Descriptive statistics.

	B/M					
	Mean			Standard errors		
MC	Low	Medium	High	Low	Medium	High
Low	1.487762909	0.589916208	0.364874215	13.855	14.4646	15.0752
Medium	1.37785449	1.115633333	0.843003382	14.5429	14.0735	15.6203
High	0.671467157	0.083064345	-0.07121754	14.6654	14.4346	13.3405

Source: Finnet and Borsa Istanbul.

returns on portfolios (described by the titles corresponding to the intersection of columns and rows) over the risk-free interest rate between July 1999 and June 2012. Accordingly, the highest excess returns come with the portfolio composed of firms that have small M and low B/M ratio, with an average of 1.49. The portfolio of firms with big M and high B/M values yields a negative return (-0.07) on average. Fixing the portfolios to include only firms with a low B/M ratio, it can be observed that average return decreases as M increases. There is also a decreasing pattern in average returns with increasing B/M, independent of the size of M. The volatilities of the average returns are reported in Table 1, along with the standard errors of the returns. The table suggests that the variations do not differ much between portfolios. The smallest standard error captured in the portfolios of firms with big M and high B/M is 13.34 and the highest variation is 15.62, which occurs in the portfolios of firms with medium M and a high B/M ratio.

The time series of these diversely sized portfolios are regressed on the presumably effective four factors: (RM-RF), SMB, HML, and FHL, as defined in Equation (2). All the factors (except the FHL we introduce) are frequently used in the literature to explain excess return over risk-free return, starting with Fama and French (1993). The results (t-statistics, R^2s, and estimated coefficients) are presented in Table 2. The intercepts range from -0.31 to 0.86. None of the intercepts (Jensen's alphas) is significantly different from zero.[6] That result is good for the model because insignificance of the intercept is interpreted as non-existence of another risk variable on average return (see, for example, Grauer and Janmaat, 2010). On the other hand, almost all of the other coefficients are statistically significant for all portfolios.

The coefficients of RM-RF, namely the market betas reported in Panel B of Table 2, are statistically significant at the 1% significance level for all portfolios, and the coefficients are close to 1 in a range between 0.88 and 0.98. That is, market return over the risk-free rate is highly responsible for the return variation of a selected portfolio.

Panel C reports the coefficients of SMB, which range between 0.01 and 1.09. The estimated coefficients of SMB are statistically significant at the 1% level for portfolios built with small and medium market-sized firms, independent of their B/M ratios. This result indicates a negative relation between portfolio stock sizes and return variation. Portfolio return increases as small firms' excess returns over big ones increases. Moreover, compared to small and medium portfolios, Table 2 shows that coefficients of small portfolios are considerably higher than those of medium ones for all B/M ratios. Indeed, the average effect is almost one to one for portfolios with small M. A decreasing pattern of coefficients continues through the portfolios, including those built with firms that have big M. However, the only significant result is for big share firms with a high B/M ratio and 95% significance. Overall, the results are comparable to Fama and French (1993) and Lam et al. (2010).

The effects of the HML factor on a selected portfolio's return variation is captured by the slope coefficient h. Fama and French state that HML slope increases from strong negative values for the lowest B/M quantile to strong positive values for the highest B/M quantile. Although our results do not follow exactly the same pattern, it is evident from Table 2 that there is a downward trend in all three market-sized clusters with increasing B/M ratios except for the biggest ME and lowest B/M. Another of our findings suggests that the portfolios of high B/M firms move opposite to market return no matter what size the M is. The largest effects are observed within the cluster of low B/M portfolios with small and medium-sized firms. The corresponding coefficients are 0.78 and 0.59, and both are statistically significant at 1%.

The coefficients of FHL are all statistically significant. Six of nine portfolios are significant at 1%, and three at 5%. On the other hand, negative signs reveal an inverse relation between foreign returns and return a selected portfolio. Adabag and Ornelas (2005) look for the behaviour of foreign traders and find evidence of negative feedback trading, suggesting that these investors adopt contrarian strategies when trading in the Turkish market. Ulku and Weber (2011) report that foreigners create a negative feedback effect on local returns when inflation-adjusted monthly data are used in Turkish, Korean, and Taiwanese markets. McCauley (2012) also assesses that when risk is on in the

Table 2. Time series regressions of value-weighted monthly excess returns using the four-factor model from July 1999 to June 2012.

$$R_t - RF_t = a + b[RM_t - RF_t] + sSMB_t + hHML_t + fFHL + e_t$$

Size (ME) Quantiles	Book to Market (B/M) Equity Quantile					
	Low	Medium	High	Low	Medium	High
Panel A		a			t(a)	
Small	0.059902	0.082128	−0.318329	0.153375	0.185529	−0.664097
Medium	0.071993	0.252727	0.857115	0.200952	0.674089	1.615447
Big	0.786480	−0.001471	−0.207918	1.390868	−0.003196	−0.635356
Panel B		b			t(b)	
Small	0.876141***	0.983780***	0.882974***	29.23081	27.77164	23.38692
Medium	0.957370***	0.906183***	0.928454***	33.93230	30.68682	22.21693
Big	0.886120***	0.936222***	0.911814***	20.79334	25.63401	35.37541
Panel C		s			t(s)	
Small	1.090274***	0.810609***	1.051932***	14.31852	9.259668	11.04437
Medium	0.765766***	0.507174***	0.677400***	10.84451	6.808023	6.425357
Big	0.011415	0.153005	0.147952**	0.104811	1.599822	2.275336
Panel D		h			t(h)	
Small	0.779584***	0.145508	−0.015394	8.719399	1.408227	−0.137804
Medium	0.588678***	0.303156***	−0.256222**	7.045457	3.469707	−2.072199
Big	0.033259	0.205858*	−0.151651**	0.257934	1.876270	−1.988533
Panel E		f			t(f)	
Small	−0.294711***	−0.461091***	−0.242486**	−3.712048	−5.055919	−2.445106
Medium	−0.249187***	−0.190175**	−0.538027***	−3.348400	−2.451735	−4.901324
Big	−0.267114**	−0.260856***	−0.183948***	−2.342102	−2.730065	−2.716919
Panel F		R^2				
Small	0.738227	0.670802	0.586023			
Medium	0.763054	0.709415	0.527583			
Big	0.568016	0.640958	0.753613			

Note:***Indicates the level of significance at the 1% level.
**Indicates the level of significance at the 5% level.
*Indicates the level of significance at the 10% level.
Source: Authors' estimations.

emerging markets, foreign capital flows in, and when risk is off foreign capital flows out. Meanwhile, domestic investors in emerging markets buy back risky assets when the risk is off (i.e. when return is low).

To determine the explanatory power of the model, explained variation is reported at the bottom of Table 2 with corresponding R^2s in the range of 0.53 and 0.76. Excluding firms with having medium M, R^2s decrease with M for low and medium B/M portfolios and increase with M for high B/M portfolios.

To check our model's validity under reasonable assumptions, we insert additional variables that may influence equity return variation, and check if they add up to any significant explanation. To this end, we add an additional variable, the standard deviation of the portfolio residuals, to the model. The results reported in Table 3 are robust with our previous findings. None of the estimated coefficients for the standard errors is statistically significant.

Table 3. Time series regressions of value-weighted monthly excess returns using the four-factor model from July 1999 to June 2012 including standard deviation of portfolio returns.

$$R_t - RF_t = a + b[RM_t - RF_t] + sSMB_t + hHML_t + fFHL + d\sigma_e + e_t$$

Size (ME) Quantiles	Book to Market (B/M) Equity Quantile					
	Low	Medium	High	Low	Medium	High
Panel A		a			t(a)	
Small	−0.827525	2.242019	1.018216	−0.254460	0.387376	0.182060
Medium	5.835411	−4.516890	2.278592	0.593994	−1.110188	0.538554
Big	4.456640	2.867789	12.11814*	1.467970	0.577131	1.783319
Panel B		b			t(b)	
Small	0.876150***	0.983966***	0.882974***	29.19853	27.74618	23.36310
Medium	0.957327***	0.906183***	0.928454***	33.90598	30.69961	22.19568
Big	0.885887***	0.935700***	0.911814***	20.80132	25.59208	35.46309
Panel C		s			t(s)	
Small	1.089823***	0.811277***	1.051932***	14.29332	9.256041	11.03313
Medium	0.765785***	0.507174***	0.677400***	10.83689	6.810860	6.419211
Big	0.011569***	0.150921	0.147952**	0.106294	1.575703	2.280976
Panel D		h			t(h)	
Small	0.779464***	0.145248	−0.015394	8.708243	1.404265	−0.137663
Medium	0.588915***	0.303156***	−0.256222**	7.043082	3.471153	−2.070216
Big	0.034683	0.203766*	−0.151651**	0.269146	1.854762	−1.993461
Panel E		f			t(f)	
Small	−0.295298***	−0.461398***	−0.242486**	−3.713957	−5.053983	−2.442616
Medium	−0.249404***	−0.190175**	−0.538027***	−3.348843	−2.452757	−4.896636
Big	−0.262480**	−0.261349***	−0.183948***	−2.301728	−2.732986	−2.723652
Panel F		d			t(d)	
Small	0.060521	−0.142743	−0.087992	0.274874	−0.374284	−0.239863
Medium	−0.388148	0.335830	−0.091309	−0.587057	1.177309	−0.338650
Big	−0.230602	−0.189960	−0.914743*	−1.230414	−0.579925	−1.816013
Panel G		R^2				
Small	0.738275	0.670910	0.586075			
Medium	0.763236	0.710284	0.527700			
Big	0.569686	0.641241	0.755360			

Note:***Indicates the level of significance at the 1% level.
**Indicates the level of significance at the 5% level.
*Indicates the level of significance at the 10% level.
Source: Authors' estimations.

Table 4. Time series regressions of value-weighted monthly excess returns using the four-factor model from July 1999 to June 2012 including standard deviation of the depreciation rate.

$$R_t - RF_t = a + b[RM_t - RF_t] + sSMB_t + hHML_t + fFHL + d\sigma_{USD} + e_t$$

Size (ME) Quantiles	Book-to-Market (B/M) Equity Quantile					
	Low	Medium	High	Low	Medium	High
Panel A	a				t(a)	
Small	0.785459	0.937539	−0.798144	1.508702	1.516209	−1.230020
Medium	0.483109	0.238601	0.622948	1.001175	0.469516	0.866416
Big	1.105347	0.141884	−0.027250	1.468471	0.228872	−0.061457
Panel B	b				t(b)	
Small	0.868626***	0.975797***	0.887675***	28.89092	27.46010	23.36640
Medium	0.953301***	0.906321***	0.930748***	33.59513	30.46259	22.11126
Big	0.882945***	0.934785***	0.910043***	20.56559	25.40476	35.05717
Panel C	s				t(s)	
Small	1.064419***	0.791611***	1.065913***	13.85409	9.018599	11.09465
Medium	0.753142***	0.507585***	0.684223***	10.56879	6.746027	6.427370
Big	0.000474	0.148327	0.142688**	0.004294	1.534071	2.173489
Panel D	h				t(h)	
Small	0.773362***	0.142861	−0.012126	8.680312	1.387177	−0.108534
Medium	0.585497	0.303252	−0.254627**	7.009009	3.465831	−2.056862
Big	0.030073	0.205099*	−0.152882**	0.232877	1.867058	−2.002581
Panel E	f				t(f)	
Small	−0.271739***	−0.442723***	−0.256601**	−3.404161	−4.845635	−2.566466
Medium	−0.236187***	−0.190590**	−0.544916***	−3.146244	−2.434026	−4.918706
Big	−0.257003**	−0.256207***	−0.178634***	−2.230645	−2.652554	−2.614683
Panel F	d				t(d)	
Small	−86.26389**	−105.8193**	57.10687	−2.096730	−1.974368	1.096775
Medium	−49.70791	1.681181	27.87011	−1.270728	0.041228	0.483072
Big	−37.26228	−16.91321	−21.50286	−0.642427	−0.345756	−0.604369
Panel G	R^2					
Small	0.740978	0.673787	0.587098			
Medium	0.763902	0.709416	0.527822			
Big	0.568473	0.641059	0.753808			

Note:***Indicates the level of significance at the 1% level.
**Indicates the level of significance at the 5% level.
*Indicates the level of significance at the 10% level.
Source: Authors' estimations.

Table 5. Time series regressions of value-weighted monthly excess returns using the four-factor model from July 1999 to June 2012 including CDS.

$$R_t - RF_t = a + b[RM_t - RF_t] + sSMB_t + hHML_t + fFHL + cCDS + e_t$$

Size (ME) Quantiles	Book-to-Market (B/M) Equity Quantile					
	Low	Medium	High	Low	Medium	High
Panel A		a			t(a)	
Small	0.142512	−0.387941	−0.272651	0.232487	−0.500964	−0.330931
Medium	0.592203	0.044755	1.703264*	0.975992	0.072056	1.854056
Big	0.290347	−0.516033	0.524993	0.322642	−0.638750	0.995677
Panel B		b			t(b)	
Small	0.848682***	1.016256***	0.866556***	28.24362	24.86585	20.54352
Medium	0.911998***	0.872386***	0.923931***	29.42882	27.43384	19.64389
Big	0.943100***	0.891758***	0.856039***	21.55957	22.16078	31.71067
Panel C		s			t(s)	
Small	0.832046***	0.826533***	0.872310***	9.743446	7.449639	7.436044
Medium	0.699825***	0.453710***	0.698869***	8.190970	5.130374	5.342900
Big	0.052591	0.110121	−0.019070	0.414895	0.962621	−0.254007
Panel D		h			t(h)	
Small	0.457981***	0.163015	−0.185741	4.902586	1.325882	−1.440157
Medium	0.459125***	0.270605***	−0.396343***	4.840401	2.783158	−2.756033
Big	0.023458	0.095901	−0.338092***	0.168459	0.771990	−4.096111
Panel E		f			t(f)	
Small	−0.305904***	−0.365713***	−0.199661*	−4.011168	−3.654616	−1.876408
Medium	−0.275356***	−0.193636**	−0.515669***	−3.521168	−2.413899	−4.346245
Big	−0.119072	−0.359643***	−0.176646***	−1.061567	−3.518521	−2.593997
Panel F		c			t(c)	
Small	5.20E−05	0.001190	−9.60E−07	0.044601	0.774002	−0.000583
Medium	−0.000602	0.000512	−0.001439	−0.501616	0.412147	−0.783589
Big	0.000518	0.001475	−0.001358	0.308040	0.934574	−1.288885
Panel G		R^2				
Small	0.704643	0.630564	0.526405			
Medium	0.702018	0.660622	0.497164			
Big	0.600014	0.570912	0.720976			

Note:***Indicates the level of significance at the 1% level.
**Indicates the level of significance at the 5% level.
*Indicates the level of significance at the 10% level.
Source: Authors' estimations.

Exchange rate volatility may also be considered because exchange rates are natural components of expected return calculations over investment decisions in capital markets, especially for foreign investors. Turkey is a small open economy with many foreign investors, thus, exchange rate volatility is important for the net return of foreign investors in US dollars. To determine the robustness of our model, we insert the standard deviation of the Turkish Lira (TL) value of the US dollar to mimic exchange rate volatility; we report the estimated coefficients and t-statistics in Table 4. The results reveal that the coefficients of the variables of the benchmark four-factor model are robust. Market betas and the SMB and FHL coefficients are all statistically significant for exactly the same portfolios as in the benchmark estimation, and they attribute the same pattern throughout the portfolios. The coefficients on the HML variable also maintain that magnitude and they are still statistically significant, except for two portfolios, for firms with medium M and low and medium B/E ratios. The estimated coefficients of the additional variable, σ_{usd}, do not possess a 1% significance in any of the portfolios. A 5% on-the-edge significance is captured only in two portfolios, built with firms that

Table 6.   Time series regressions of value-weighted monthly excess returns using the four-factor model from July 2001 to June 2008.

$$R_t - RF_t = a + b[RM_t - RF_t] + sSMB_t + hHML_t + fFHL + e_t$$

Size (ME) Quantiles	Book-to-Market (B/M) Equity Quantile					
	Low	Medium	High	Low	Medium	High
Panel A		a			t(a)	
Small	0.275361	0.150790	−0.190923	0.651895	0.233239	−0.297033
Medium	0.767044	0.569035	2.028572	1.623434	1.071735	2.877280
Big	1.417098*	0.703164	−0.201875	1.908975	0.898226	−0.558101
Panel B		b			t(b)	
Small	0.861307***	1.121130***	0.947053***	20.43209	17.68226	14.88749
Medium	0.978068***	0.930547***	1.082114***	20.72587	17.70878	15.50838
Big	1.067631***	0.969665***	0.828219***	14.86486	12.53468	23.13537
Panel C		s			t(s)	
Small	0.727847***	0.914488***	0.864733***	7.117146	6.020427	5.656500
Medium	0.624482***	0.400226***	0.517998***	5.587812	3.169380	3.089157
Big	−0.091339	0.113740***	0.021482	−0.516967	0.597539	0.249706
Panel D		h			t(h)	
Small	0.403454***	0.092462	−0.258252	3.448216	0.506580	−1.450522
Medium	0.458794***	0.185377	−0.870790***	3.492948	1.260491	−4.459033
Big	−0.319671	−0.135857	−0.208995**	−1.567015	−0.628588	2.085935
Panel E		f			t(f)	
Small	−0.406266***	−0.485560***	−0.326491**	−4.239701	−3.455323	−2.265663
Medium	−0.265353**	−0.238198**	−0.374189**	2.482621	−2.001084	−2.367343
Big	−0.290036*	−0.538721***	−0.150287*	−1.747493	−3.064432	−1.853229
Panel F		R^2				
Small	0.737961	0.641030	0.501853			
Medium	0.726963	0.636549	0.505646			
Big	0.596101	0.487617	0.743373			

Note:***Indicates the level of significance at the 1% level.
**Indicates the level of significance at the 5% level.
*Indicates the level of significance at the 10% level.
Source: Authors' estimations.

have small M and low and medium B/E ratios. That is, the newly introduced exchange rate volatility factor does not contribute to the explanatory power of our four-factor model, likewise the intercept. Indeed, the R^2s of the modified model, presented at the bottom of the Table 4, differ only slightly from those of the original model and so preserve the same pattern.

We reiterate the robustness check by adding credit default swap (CDS) (gathered from Bloomberg) spreads of Turkey's five-year benchmark government bonds as another expected explanatory variable. This data could explain the variation in equity return for at least two reasons. First, it indicates the risk level of the overall economy, which is of course interrelated with stock market returns. Second, it can be regarded as a means of comparison between the returns of government bonds and equities. The results of estimating our four-factor model including the CDS spread are reported in Table 5. Once more, the estimated coefficients of the original model are robust. All the estimated intercepts are insignificant and the market betas and coefficients of SMB, HML, and FHL are significant at almost the same levels, with almost the same patterns. None of the coefficients of the CDS variable are significant, and the R^2s remain almost unchanged.

For one last robustness check, we do not change the variables but control for the data interval. The intention is to exclude the latest financial crisis period, which is

interpreted as a period of possibly abnormal capital movements sourced by quantitative easing of big central banks. Moreover, the effect of the February 2001 financial crisis must be accounted for. We thus re-estimate Equation (2) using data from July 2001 to June 2008. The results of the estimation are presented in Table 6. Compared to Table 2, which represents the estimation results of same equation with the full range of data, it is evident that the validity of the coefficients with respect to the t-values remains mostly the same. The only notable difference is the magnitude of the coefficients. While the absolute values of the coefficients represented in Table 2 are bigger than the ones in Table 6 for the variables of RM-RF, SMB, and HML, the coefficients of FHL in Table 2 are smaller than the coefficients of the same variable in Table 6 in absolute terms. However, the basic results of the article are robust.

4. Conclusion

This article aims to explain stock return variation by adding foreign investors' portfolio preferences (foreign ownership) to the Fama–French (1993) three-factor model. After adding this fourth factor, the empirical results on the existent variables, namely excess market return, SMB, and HML, remain mostly parallel to Fama and French's (1993) findings. Accordingly, market betas are statistically significant for all portfolios and the coefficients are close to 1. We find a statistically significant negative relation between portfolio stock size and return variation, which suggests that portfolio return increases as small firms' excess returns over big ones increases. It can also be deduced from the statistically significant results of the HML variable that there is a decreasing effect on return in all three market-sized clusters with increasing B/M ratios except for the biggest ME and lowest B/M. Moreover, the portfolios of high B/M firms move in an opposite direction to market return, regardless of the size of M.

As for the newly introduced variable, FHL, we obtain statistically significant results to indicate a negative tradeoff between returns on high foreign portfolio shares and returns on a selected portfolio built by pre-defined Ms and B/M ratios. The intercepts are not proved to be statistically significant from zero and the explained variation is between 0.52 and 0.76 for all portfolios. The results are also robust when proxies on exchange rate volatility and market risk are separately added to the model because they are assumed to have additional explanatory power on stock variation. Excluding the post-2008 crisis period does not alter estimation results.

The negative relation between high foreign portfolio shares and portfolio returns are parallel to the findings of Choe, Kho, and Stulz (2005) and Jung et al. (2009) for Korea, but contrary to those of Grinblatt and Keloharju (2000) for Finland and to Huang and Shiu (2009) for Taiwan. Our results suggest that domestic investors demand additional compensation for bearing the risky assets that foreign investors do not carry.

Many studies cannot find increased excess return in the wake of capital inflows. This result can be explained by the fact that mostly-institutionalised foreign investors are sophisticated enough to flow in when the market is low and flow out when it is high. This finding can also be a result of the stabilising policies of Turkey's central bank, which must take into account the current account deficit and inflation in the wake of capital flows that eventually manage the traffic between the stock market and its alternative, the bonds market. If this is the case, then the central bank's stabilising interest rate decisions would repress market return whenever there is excess return of foreign ownership.

Another explanation could be related to the structural quality of firms in the stock market. As noted by Kang and Stulz (1997) and Dahlquist and Robertsson (2001) for

Japan, foreigners invest in large and very liquid firms so that these firms are associated with low returns. Jung et al. (2009), on the other hand, explain increased returns by excess return on high foreign ownership as a result of big firms operating in research and development (R&D), which create even higher returns according to Tobin's q theory. As for Turkey, five of the top 10 companies in the market are commercial banks. Among the rest, two operate in telecommunications, two are the biggest investment holdings companies in Turkey, and one is a brewery company. Thus, their R&D spending is insignificant compared to their total assets, and it is quite unlikely that R&D spending could affect their profitability. Moreover, of Turkey's top 30 companies, only three (Arcelik, Sise Cam, and BSH home appliances) might be affected by R&D spending, but they mostly import the technologies necessary for production. For these reasons, it would be reasonable to assume that for the Turkish market, liquid and big firms' stocks that give low returns and high foreign ownership do not stimulate high profits.

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Notes

1. Borsa Istanbul was called the Istanbul Stock Exchange before its name was officially changed on April 3, 2013. In its current form, Borsa Istanbul also hosts the former gold and derivatives exchanges.
2. Foreign holdings are around 30% in the Korean stock market and close to 70% in the Turkish stock market.
3. We also considered momentum as a fourth factor to the three factors that Fama and French (1993) suggest, but especially for earlier years, the portfolios constructed were too sparse and the returns were unstable. We believe the reason for this result is having too few assets in the early stages of our sample, when momentum is included along with portfolio holdings of foreign investors and the three factors that Fama and French suggest. Because of our undesirable findings, we did not consider momentum as a fourth factor in our study. Various other studies also consider momentum as a fourth factor for BIST, but produce conflicting results. Kandır and Inan (2011) analyse the profitability of the momentum factor and report that its performance is not good for the three-, six- and nine-month periods. Balı (2010) finds that except for the 60-month period, the strategy is not successful On the other hand, Unlu (2013) finds significance of the momentum factor in affecting expected stock returns.
4. Between 12.04.1999 and 28.07.1999, the data is obtained from Reuters.
5. We also consider other rates as risk-free rates, such as overnight interest rate, US dollar depreciation rate, US dollar depreciation rate plus US three-months treasury bill rate, and the depreciation rate of the basket (1 USD + 1 Euro). The overall results are robust.
6. The level of significance is at 5% unless otherwise noted.

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